

## BRIEF REPORT

## Diagnostic Accuracy of Ascites Fluid Gross Appearance in Detection of Spontaneous Bacterial Peritonitis

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### Abstract

**Introduction:** Spontaneous bacterial peritonitis (SBP) as a monomicrobial infection of ascites fluid is one of the most important causes of morbidity and mortality in cirrhotic patients. This study was aimed to determine the diagnostic accuracy of ascites fluid color in detection of SBP in cirrhotic cases referred to the emergency department. **Methods:** Cirrhotic patients referred to the ED for the paracentesis of ascites fluid were enrolled. For all studied patients, the results of laboratory analysis and gross appearance of ascites fluid registered and reviewed by two emergency medicine specialists. The sensitivity, specificity, positive and negative predictive value, and positive and negative likelihood ratio of the ascites fluid gross appearance in detection of SBP were measured with 95% confidence interval. **Results:** The present project was performed in 80 cirrhotic patients with ascites (52.5 female). The mean of the subjects' age was 56.25±12.21 years (35-81). Laboratory findings revealed SBP in 23 (29%) cases. Fifty nine (73%) cases had transparent ascites fluid appearance of whom 17 (29%) ones suffered from SBP. From 21 (26%) cases with opaque ascites appearance, 15 (71%) had SBP. The sensitivity and specificity of the ascites fluid appearance in detection of SBP were 46.88% (CI: 30.87-63.55) and 87.50% (95% CI: 75.3-94.14), respectively. **Conclusion:** It seems that the gross appearance of ascites fluid had poor diagnostic accuracy in detection of SBP and considering its low sensitivity, it could not be used as a good screening tool for this purpose.

**Key words:** Peritonitis; ascites; diagnostic tests, routine; mass screening

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### Introduction:

Spontaneous Bacterial Peritonitis (SBP) is one of the most important causes of mortality and morbidity in cirrhotic patients (1, 2). SBP is a monomicrobial infection of ascites fluid which has no determined source for surgery treatment (3, 4). It was the result of transferring the bacteria through the intestinal wall to mesenteric lymph nodes and then into ascites fluid (5, 6). 10% to 30% of cirrhotic patients hospitalized because of ascites are at risk for SBP (2, 3). With early detection and antibiotic treatment, quickly and timely, the mortality rate of SBP has decreased from 80% to 20-30% (4, 7, 8). The studies have shown that the most common types of microorganisms responsible for SBP arise from the Enterobacteriaceae group like *Escherichia coli* (*E. coli*) (1, 3, 9). SBP detection was done with observing more than 250 polymorphonuclears (PMN) or 500 white blood cells (WBC) per cubic millimeter of ascites fluid (4). Assessment of ascites

fluid with dipstick is a rapid, simple, and cost-effective method for classifying it into transudate and exudate (10). The color of abnormal ascites fluid has a high sensitivity in the confirmation of SBP so that with a transparent ascites fluid it can be rejected (11). On the other hand, in some studies it was revealed that SBP was rare in cirrhotic patients without symptoms (12-14). However, not enough studies have been done regarding the correlation between ascites fluid color and SBP and there are different results in the previous studies. Therefore, this study was aimed to determine the diagnostic accuracy of ascites fluid color in detection of SBP in cirrhotic cases referred to the emergency department (ED).

### Methods:

It was a study of diagnostic methods. Cirrhotic patients referred to the ED of Emam Khomeini hospital, Sari, Iran, through February 2011 to March 2013, for the paracentesis of ascites fluid were enrolled. The study protocol was approved by local ethic committee and in accordance with Helsinki declaration. Patients with ascites caused by another reason except liver cirrhosis were excluded. For all studied patients, the samples of

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**Table 1:** The results of diagnostic tests of ascites fluid appearance in detection of spontaneous bacterial peritonitis

Diagnostic tests	Value (%)	95% confidence interval
Accuracy	71.2	60.5-80.0
Sensitivity	46.9	30.8-63.6
Specificity	87.5	75.3-94.1
Positive predictive ratio	71.4	50.0-86.2
Negative predictive ratio	71.2	58.6-81.2
Positive likelihood ratio	3.8	1.6-8.6
Negative likelihood ratio	0.6	0.4-0.8

ascites fluid were sent to the same reference laboratory for cell counting and biochemical analysis; then the results of laboratory and gross appearance registered and reviewed by two emergency medicine specialists. The gross appearance of ascites fluid included two groups of transparent or not. The transparent appearance was considered as the lack of SBP and other cases such as bloody, opaque, hazy, cloudy, or milky ascites fluid as the presence of SBP. More than 250 PMN or 500 WBC per cubic millimeter of ascites fluid was considered as SBP (4). In this project, no additional intervention was imposed to the patients. Informed consent received from patients for entering to the study. All the costs of included subjects were free. The achieved data was statistically evaluated using SPSS version 20. The gross appearance and cell counting results were compared by chi-squared test. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive (PLR), and negative likelihood ration (NLR) of the ascites fluid gross appearance in detection of SBP were measured with 95% confidence interval.

#### Results:

The present project was performed in 80 cirrhotic patients referred to the ED for paracentesis of ascites fluid (52.5% female). The mean and standard deviation of the subjects was 56.25±12.21 years (range: 35-81). Laboratory findings revealed SBP in 23 (29%) cases. The mean age of patients who suffered SBP was 57.09±19.30 and for those lack of SBP 55.68±15.76 years ( $p=0.6$ ). Fifty nine (73%) cases had transparent ascites fluid appearance of whom 17 (29%) ones suffered from SBP. From 21 (26%) cases with opaque ascites appearance, 15 (71%) had SBP. [Table 1](#) shows the results of diagnostic tests of ascites fluid appearance in detection of SBP.

#### Discussion:

In this project the sensitivity and specificity of the ascites fluid appearance in detection of SBP were 46.88% (CI: 30.87-63.55) and 87.50% (95% CI: 75.3-94.14), respectively. Gross appearance of SBP fluid had 71.25% (60.54-80.01) accuracy in SBP prediction. In the Brian Chinnock et al. study the sensitivity and specificity of the abnormal ascites color were reported 98% (95% CI:

95.3-99.5) and 22.7% (95% CI: 19.4-26.3), respectively (11). They declared that clear appearance of ascites fluid might safely exclude SBP. On the other hand, in other studies ascites fluid appearance had a low sensitivity in detection of SBP (15, 16). They concluded that the gross appearance of ascites fluid is insufficient for diagnosis or exclusion of SBP and suggested the routine laboratory analysis of ascites fluid for rule in/out of SBP. Considering the low sensitivity and NPV of ascites fluid color in SBP detection, it is not possible to detect or reject SBP using the gross appearance of ascites fluid. It was suggested to perform this study with more sample size and in several centers for getting more convincing results.

#### Conclusion:

It seems that the gross appearance of ascites fluid had poor diagnostic accuracy in detection of SBP and considering its low sensitivity, it could not be used as a good screening tool for this propose.

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#### Conflict of interest:

None

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#### Authors' contributions:

None

#### References:

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